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## A longitudinal model of residential mobility

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*Iowa State University*

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**A LONGITUDINAL MODEL OF RESIDENTIAL MOBILITY**

*Iowa State University*

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A longitudinal model of residential mobility

by

Jean Ann Memken

A Dissertation Submitted to the  
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Signature was redacted for privacy.

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For the Graduate College

Iowa State University  
Ames, Iowa

1984

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## CHAPTER I. INTRODUCTION AND LITERATURE REVIEW

## Purpose

The purpose of this dissertation is threefold. First, to better understand the relationships between household and housing characteristics, housing needs and moving behavior, a model of residential mobility is outlined. This model is then tested to lend support to the housing theory upon which it is based. Second, this dissertation is an examination of the time frame over which various events occur that result in changing housing needs and subsequent mobility. Specific hypotheses regarding mobility as it relates to time are formulated and tested, using probit analysis to analyze event history data. Finally, this dissertation is an investigation of whether moves of differing order are explained by different independent variables.

There are four main topics covered in this dissertation:

- 1) Changes in the number of members in the household
- 2) Residential crowding
- 3) Total residential mobility
- 4) Residential moves of specific order.

## The Importance of the Study of Mobility

There are three reasons why the study of residential mobility is important. First, mobility is one of the most significant forces underlying changes in urban areas (Rossi, 1955). Mobility trends, therefore, are of particular interest to municipal officials and urban planners. The study of mobility can provide useful information about the

demand for housing by indicating which factors are associated with the desire to change residences and which factors promote housing satisfaction and staying in a particular residence (Newman, 1975).

Second, mobility studies are important because an understanding of the nature and effectiveness of the various pressures that give rise to mobility is critical to the evaluation of many other decisions made about the neighborhood and the community in the public and private sectors. Previous research has shown that most people move three or four times during a lifetime because of changes within their lives such as leaving the parental home, marriage, and changing family needs. However, there are other demographic characteristics and events that give rise to residential mobility as well (Moore, 1972). Knowledge of the determinants of mobility is important to the housing industry and government housing officials.

Since the data on residential mobility in the United States first became available in the 1940s, approximately one out of five individuals has moved each year (U.S. Bureau of the Census, 1974). That the percentage of the population that moves each year has fluctuated in the narrow range between 17 and 22 percent is an amazing phenomenon, considering the economic, political, and social changes that have taken place during the last 40 years. Such events as a severe housing shortage, two cold wars, two severe recessions, an increasing and then decreasing rate of household formation, family composition and size changes, an energy shortage, and a rising percentage of homeowners in the population have done little to affect the mobility rate in this country. The fact that

mobility has remained relatively constant gives rise to the idea that moving behavior must be affected by characteristics and processes that are relatively insensitive to such events (Rossi, 1980). Therefore, a final rationale for the study of residential mobility is the need to better understand how various household and housing characteristics relate to the mobility process.

### Review of the Literature

The conclusions from a number of residential mobility studies are discussed in this review of literature. Household characteristics and their relationship to moving behavior are described. A discussion of the fit between housing and household characteristics is included. Various models of residential mobility are discussed. This section concludes with a detailed description of the theoretical framework on which this dissertation is based.

#### Household characteristics and mobility

The family life cycle and mobility      An important aspect of Rossi's (1955) study was the use of the stage in the family life cycle as a determinant of residential mobility. According to Rossi, there is empirical evidence that the position in the family life cycle can be used to predict residential mobility. Other studies in residential mobility have supported the idea of a relationship between stage of the family life cycle and residential mobility (Chevan, 1971; Pickvance, 1973, 1974).

The life cycle hypothesis as advanced by Rossi (1955) and Chevan (1971) simply states that housing needs change systematically with the

life cycle of the family, and the act of moving is primarily a means of bringing housing needs and actual housing conditions into equilibrium. Morris and Winter (1978) view the family life cycle as a "progression of housing norms" which imply different housing needs at different life cycle stages. According to the life cycle concept, an average American family goes through a series of life cycle stages which may include the following:

1. Single person--Establishes own home away from family home.
2. Couple--Marriage until arrival of first child.
3. Expanding Family--From arrival of first child until one or more children reaches adolescence.
4. Launching Family--All children have reached adolescence until last child leaves home.
5. Empty Nest--Last child has left home.
6. Active Retirement--Still healthy and capable of independent living.
7. Restricted Retirement--Declining health (Lindamood and Hanna, 1979).

Distinct social, economic, and demographic characteristics are included in each stage in the cycle. The importance of the life cycle concept for the study of mobility lies in the fact that the housing needs of the family are assumed to vary as it goes through the stages. Therefore, rates of residential mobility differ at different stages of the life cycle (Okraak, 1971). The relationship between the family life cycle, changing housing needs, and residential mobility is further supported by the fact that most of the moves undertaken by households throughout their lifetimes cluster in the first decade when the household generally goes through several life cycle stages (Rossi, 1955).

In spite of the support for the use of life cycle stages in models of residential mobility, the idea has some limitations. First, while the concept of life cycle is generally derived from static data pertaining to one point in time, in mobility studies, it is used to explain a dynamic pattern of family behavior. In other words, the researcher must assume that the characteristics of families observed at a particular moment in time will prevail at other moments. If there are no large-scale shifts in socioeconomic patterns, there is no need to be concerned with using static life cycle data to describe sequential behavior. However, it is hardly a reliable method to employ under conditions of rapid change (Okroku, 1971).

Second, a difficulty with the concept of family life cycle and its use in studies of mobility is that there is very little agreement among researchers about how the various stages in the family life cycle are defined (Quigley & Weinberg, 1977). Demographic trends such as increasing numbers of single-parent families, single-person households, and postponement of marriage and childbearing make it difficult to classify many households into a parsimonious set of life cycle stages. Both of these limitations make it difficult to achieve an operational definition of the life cycle except in nominal terms.

Finally, while the life cycle stages serve to identify families with substantially different moving propensities, the stages themselves cannot be considered as the actual cause of residential mobility. According to Gladhart (1973),

We must look to the demographic changes which characterize some life cycle stages and changes between stages in order to discover the forces which give rise to mobility (p. 6).

Other mobility studies (Butler et al., 1964; Speare et al., 1974; Fredland, 1974) have used household characteristics to typify various life cycle stages as explanatory variables. Such characteristics as age of the major adults in the household, household size, marital status or some measure of household composition (such as number and age ranges of children in the household) have been utilized in place of family life cycle stage in some studies of residential mobility.

Although Rossi (1955) formulated the idea that housing needs are strongly conditioned by family life cycle stage, in his study of residential mobility, the original idea of life cycle stages was abandoned and each household was characterized by the age of the household head and the number of members in the household. This cross-classification seemed to provide a sufficient amount of explanation of the family life cycle to be of significant use in a mobility model. A similar approach was used by Gladhart (1973). Rather than categorizing observations according to the family life cycle, various continuous and discrete demographic variables associated with the family life cycle stages were included in the present model to explain residential mobility.

Age and mobility Morrison (1967) recognized age as an interactive component in his evaluation of a stochastic mobility model. With renters, it appears that mobility declines with age, but in a curvilinear fashion (Fredland, 1974). Okraku (1971) found that old age restricts the mobility of homeowners, much more than that of renters. Age is less important in the mobility of homeowners than it is in that of renters, as evidenced in a study by Fredland (1974). He discovered that mobility rates are much

higher for young families and that younger families are more likely to be renters. In a study of the causal relationships between a number of exogenous variables and mobility, Crull (1979) found that age had a direct, statistically significant, negative relationship with residential mobility.

In other studies that analyzed the main effects of age on residential mobility, the general conclusion is that younger families are much more likely to move than older ones (Rossi, 1955; Butler et al., 1964; Pickvance, 1973; Duncan & Newman, 1976; Carey, 1979). A study of mobility patterns in a metropolitan area in the late 1800's indicated that young families and single individuals comprised the largest portion of the mobile population (Kopf, 1977).

Household size and mobility      The larger the size of the family, the greater is the desire to move (Rossi, 1955; Crull, 1979). Moreover, families who have young children present or who expect additional children are more likely to move than those who do not, and the likelihood becomes greater when more children are expected (Okrauk, 1971; Duncan & Newman, 1976). The birth of a child correlates positively with mobility rates (Fredland, 1974), although Morris (1977) and Carey (1979) discovered that fertility does not have a strong, direct influence on residential mobility.

Education and mobility      Residential mobility has not been found to have any significant relationship with education. Research has shown, however, that intercounty migration is positively related to education (Duncan and Newman, 1975). Because education is one demographic component

of the broader measure of socioeconomic status, it would be expected that a similar relationship would be found between mobility and social status.

Length of residence and mobility McGinnis (1968) developed the Axiom of Cumulative Inertia which involves the relationship between length of residence and mobility. According to McGinnis, as the duration of residence increases, the probability of making a move within the next time period declines. The effect is assumed to occur because the habits of the household become more strongly established within the home as the length of residence increases. Other studies (Morrison, 1967; Newman, 1975) support the axiom. Gladhart (1973) discovered that duration of residence is negatively related to the mobility of homeowners, but that it is unrelated to the mobility of renters.

The findings of McGinnis (1968), Morrison (1976), and Newman (1975) apparently can be explained in part by the introduction of residential tenure. Speare (1974) found that duration of residence is negatively related to mobility but that a portion of the relationship is indirect through residential satisfaction. When he separated renters and owners, Speare found that for owners all of the effect of duration of residence is indirect through residential satisfaction. For renters however, all of the negative effect of duration of residence on mobility is direct with no effect on satisfaction.

Barrs (1975) tested a mobility model which included duration of residence as an independent variable. The results of the analysis revealed that length of residence has an indirect effect on residential mobility. Length of residence exhibited a positive relationship to



housing deficits, in particular, space deficit. That is, the longer a household resides in a particular dwelling, the more likely they are to report a space deficit. Increases in family size over time contribute to this reported deficit by the household. Housing deficits have a causal relationship with housing satisfaction, which, in turn, is related to the propensity to move. The conclusion drawn from this research supported the use of length of residence as an independent variable in a normative housing deficit model.

Taken together the literature on length of residence indicates that 1) as time passes, changes in household size and composition occur, 2) those changes alter the relationship between the space available and the number and characteristics of the household, 3) that altered relationship affects the level of satisfaction, 4) changes in satisfaction affect the probability of moving, 5) the connections from 1) to 4) are somewhat different for owners and renters. (Because of the nature of the present data set, the role of satisfaction must be only implicit.) A portion of the analysis in this dissertation is intended to shed additional light on the effects of length of residence.

Chronic mobility Closely related to length of residence is chronic mobility which has been defined as the number of times a household has moved prior to the time of the interview (Gladhart, 1973; Barrs, 1975). Van Arsdol et al. (1968) considered the relationship between previous mobility and actual moving behavior. They concluded that the number of prior local moves can be used to predict subsequent mobility. Persons who have moved in the past are more likely to move in the future, whereas

those who have remained in the same residence over a long period of time are oriented to continued stability. Several other studies have examined the relationship between chronic mobility and subsequent moving behavior. The results of these studies indicate that previous moving behavior is positively related to subsequent mobility (Gladhart, 1973; Morris, 1977; Carey, 1979).

#### The fit between housing and household characteristics

Tenure, structure, and mobility      A number of studies have investigated the relationship between residential mobility and tenure status. The results of those studies indicate that residential mobility is negatively related to homeownership, that is, subsequent mobility is much higher for renters than it is for those who own their homes (Rossi, 1955; Boyce, 1969; Okraku, 1971; Gladhart, 1973; Pickvance, 1973, 1974; Fredland, 1974; Crull, 1979; Duncan and Newman, 1976; Carey, 1979).

Michelson (1977) regards tenure as the most powerful predictor of mobility. The apparent reason there is such a strong relationship between these two variables is that owning a dwelling is an important housing goal. Homeownership is recognized by society as being very important, and therefore, those who are not homeowners tend to uproot themselves and move to owned homes as soon as they are able. Boyce (1969) gives a different reasoning for this relationship with belief that the effort of moving, in economic and psychological as well as physical terms, is usually much lower for renters than for owners.

Quigley and Weinberg (1977) have questioned the inclusion of tenure

status in a model of residential mobility. Households attempting to fulfill their housing needs are striving toward a state of equilibrium or stability. To achieve this stability, they purchase their own home and thus, fulfill their housing needs. Therefore, to say that homeowners are more stable than renters and are less likely to move borders on the tautological (Quigley and Weinberg, 1977).

Mobility is an adjustment process whereby a household brings its housing into line with its needs (Rossi, 1955; Moore, 1972). Housing needs are primarily conditioned and strongly based on cultural norms. In the United States, the housing norms prescribe ownership of a single-family dwelling. Therefore, when a household moves from a rental unit to an owned single-family dwelling, it is fulfilling a housing need. Once that need is fulfilled, there is little reason for the household to make other adjustments to its housing by subsequent moving. It seems logical then, that the tenure status of the household and the structure-type of the present dwelling have a direct relationship with residential mobility.

Residential crowding and mobility For the individual household, residential mobility is one of the most important mechanisms for adjusting the housing and neighborhood to meet changing family needs and desires (Moore, 1972). The need for adequate space is one housing need which has been given a great deal of attention in mobility studies. Residential crowding has been shown to be positively related to residential mobility, although the definition of crowding varies from study to study. In census data, a persons-per-room ratio is calculated and if the result exceeds one, the household is said to be "overcrowded". Spain (1980) used

persons-per-room as the determinant of residential mobility. Fredland (1974) and Duncan and Newman (1976) used similar measures with other data. All concluded that crowding is a determinant of residential mobility. The same conclusion was reached in studies by Gladhart (1973), Morris (1977), and Carey (1979). However, they used bedroom deficit, a variable based on the number of actual and needed bedrooms, to measure residential crowding.

An early research project on the determinants of local mobility which included residential crowding as an explanatory variable was conducted by Rossi (1955). He discovered that 51 percent of the individuals interviewed who had moved cited complaints about the amount of living space as contributing to the desire to move. Forty-four percent said living space was the primary reason for moving. Newman (1975) also investigated residential mobility and its relationship to available living space. The main conclusion of her study was that complaints about the dwelling conditions, particularly the available living space, are considered to be a prime source of dissatisfaction, and that dissatisfaction leads to residential mobility.

Several indices have been developed by researchers to measure residential crowding. Greenfield and Lewis (1969) developed an index which took into consideration societal values on bedroom sharing as well as current governmental policies regarding space and privacy. Duncan and Newman (1975) and Goodman (1974) developed measures of residential crowding based upon family composition.

To measure residential crowding, Gladhart (1973), Morris (1977) and Carey (1979) used a bedroom deficit index which compared the number of

persons in the household with available bedroom space. That index was chosen for this analysis to measure bedroom deficit. With that index, a bedroom is assigned to each of the following: 1) the parental couple (or single parent); 2) each child aged eighteen or over; 3) each of the children of the same sex less than four years apart in age, at least one of whom is between 9 and 17 years of age; 4) each pair of children, regardless of sex, less than four years apart in age, and both under the age of nine; and 5) each additional couple or adult in the household. No more than two persons were assigned to a bedroom.

#### Models of residential mobility

Numerous studies have been done on geographic mobility. To clarify the concepts used in this dissertation three definitions are needed. First, residential mobility is defined as any change from one residence to another. Within residential mobility, there are two types: 1) housing mobility which is defined as a local move made for purposes having to do with the dwelling, the neighborhood, and access to community facilities, 2) migration which is long distance movement made for purposes having to do with employment, retirement, climate and recreation. The distinctions made are customary ones although the exact terms used to refer to the underlying concepts vary. It is often empirically difficult to distinguish between them, however, because so much depends upon the locality in which the move takes place (Rossi, 1980). For example, a move to improve housing conditions in an isolated rural area may involve traveling to the next county because it is the closest available housing that will meet the household's needs. A move within a large metropolitan

area could be for employment considerations and could, therefore, involve a change in both housing and labor markets, even though the actual distance moved is not great.

Within many of the mobility models that have been developed, some measure of housing sufficiency based on cultural norms is included (Rossi, 1955; Gladhart, 1973; Fredland, 1974; Newman, 1975; Morris, 1977; Morris & Winter, 1978; Carey, 1979). Families experience a normative housing deficit when their housing situation does not comply with that prescribed by cultural norms as being acceptable. One alternative for a family in this situation is to move.

Moore (1969) developed a mobility model which explains mobility rates by certain social and demographic characteristics. Similarly, Brummel (1979) developed a mobility model which included the idea that the household's actual mobility decision is affected by various demographic characteristics, in particular, income.

Brummel's (1979) general model of mobility behavior is based upon consumer choice theory. The model interrelates the concepts of place utility and the household's aspirations, needs, and stress. A household's decision to move is in response to a perceived difference between what the household has (experienced place utility) and what the household believes it could have if it moved (attainable aspirations). This difference is defined as the household's residential stress. Once this stress becomes great enough, the household will move.

### Theoretical Framework for the Study of Residential Mobility

The theoretical framework upon which this dissertation is based is the Morris and Winter (1978) model of housing adjustment. This model, which is structural-functional (Parsons, 1975) in nature, portrays residential mobility as a response to housing dissatisfaction brought about by a deficit in the current dwelling.

The Morris and Winter model is based on two key concepts: 1) norms, or the rules and ideals that an individual or family believes to be acceptable and to which they strive to conform, and 2) constraints, which are the barriers that tend to prevent a family from achieving the norms. For example, homeownership is a norm in this country for housing tenure. The "Great American Dream" is to be a homeowner. However, because of certain constraints, primarily economic, not everyone is able to achieve the goal of homeownership.

When a norm has not been achieved because of one or more constraints, the household experiences a deficit. Deficits are defined by Morris and Winter (1978) as a deviation from a preferred state or state of equilibrium. The household tries to maintain a state of equilibrium of a minimum of deficits given the constraints. When an event occurs, such as a birth of a child that changes the family's space needs, the household may experience a deficit.

If a perceived deficit is deemed by the household to be salient, that is, the family values are such that they consider the deficit to be important, the household becomes dissatisfied and attempts to eliminate

the deficit. Once the deficit has been removed, the household returns to an equilibrium state provided some other deficit has not been introduced.

A household is engaged in a dynamic process of evaluating its housing in terms of both cultural and family norms. The goal of the household as it proceeds through the housing adjustment process is to reach a zero or near-zero normative housing-deficit situation. When this occurs, the household reaches a state of equilibrium and achieves housing satisfaction (Morris & Winter, 1978).

Because a normative housing deficit causes a significant reduction in housing satisfaction, housing adjustment is more likely to occur in households that experience normative housing deficits. Morris and Winter (1978) use general housing satisfaction as the adjustment criterion rather than satisfaction with specific aspects of the dwelling.

When there is a reduction in overall housing satisfaction, the household behaves in such a way as to reduce the normative housing deficit that caused the dissatisfaction. Oftentimes the success of this behavior depends upon how well the household can overcome the constraints that impinge on its ability to adjust its housing to meet current needs. The constraints may relate to the household itself and its overall performance as a working unit. Constraints may also include the social, economic, or political barriers a household may have to confront. The dwelling itself may act as a constraint if it has highly attractive features which deter the household from making an adjustment even if overall they are dissatisfied with the dwelling.



The responses a household makes to normative housing deficits are fourfold. First, the household can move. Residential mobility is generally motivated by a normative housing deficit.

A second response to a normative housing deficit is to make residential alterations or additions. Households may make changes in their current dwelling to alleviate dissatisfaction.

Other ways that a household can respond to housing deficits involve changing the composition or organization of the household so that the present housing situation concurs with the household's norms. Neither organizational or compositional adjustment of the household involves any physical changes to the dwelling.

#### Residential Mobility

It is the first option, residential mobility as a response to a housing deficit, which is the focus of this dissertation. Although residential satisfaction plays an important role in the adjustment model, the present analysis has excluded satisfaction because of the nature of the data. In this analysis, residential mobility is defined as any move from one residence to another. It is important to note that the mobility variable used in this dissertation includes all moves, whether a local change in residence or migratory in nature. The effect of including migration actually weakens the significance of the resulting estimates. There is a procedural reason for using all moves rather than local moves as the event to be explained. The event history form of data uses twelve months as the length of the unit observation. The proportion of

households that move during that time period is quite low. Local moves would be even lower. This procedural reason is ever more convincing when residential mobility is partitioned into first, second, third, and fourth or higher order moves. a negative bedroom deficit.

#### Models and Hypotheses

The main model to be tested in this dissertation is:

$$P(M_i) = f(\text{household}_{ji}, \text{housing}_{ki})$$

where the subscript j refers to the various household characteristics and k represents housing characteristics, and subscript i designates a particular household.

Previous mobility studies have attempted to characterize all residential moves in terms of a simple set of explanatory variables. A similar procedure is used in the initial portion of this dissertation. However, in the final part of the analysis, mobility is differentiated by the order of the move, that is, first, second, third, and fourth or higher order moves to see whether the explanatory power of the independent variables varies from one move to another. Therefore, in the final portion of this analysis, the mobility model under consideration would be as follows:

$$P_1(M_i) = f(\text{household}_{ji}, \text{housing}_{ki})$$

where the subscript 1 indicates the order of the move.

Using these models as a framework, several hypotheses can be formulated. The following is a list of relationships to be tested.

### Change in household size

Changes in household size are affected by a number of demographic and housing characteristics. These changes in size of the household directly affect whether there is a bedroom deficit, which in turn, affects residential mobility. The hypothesized model to be tested for change in household size looks like this:

$$P(\text{Change in household size}) = f(\text{Age, time, months since a move, number of previous moves, owned single-family dwelling, education})$$

### Bedroom deficit

Several events and conditions are significantly related to whether a household experiences a bedroom deficit. The hypothesized model for bedroom deficit is as follows:

$$P(\text{Bedroom Deficit}) = f(\text{Change in household size, age, time, months since a move, number of previous moves, owned single-family dwelling, education})$$

Lack of bedroom space encourages housing adjustment. Therefore, mobility is positively related to bedroom deficit.

### Residential mobility

The hypotheses about the effects of the independent variables on residential mobility are as follows:

1. Age at marriage The older an individual is at the time of marriage, the less likely they are to move. Therefore, age at marriage has a significant negative relationship with residential mobility.
2. Time Residential mobility decreases over time. Mobility is negatively related to the time variable.
3. Months since a move The longer a household resides at a particular

dwelling, the less likely a move will occur. Months since a move and residential mobility are negatively related.

4. Number of previous moves Chronic mobility is positively related to moving behavior. This means that residential mobility is positively related to number of previous moves.
5. Tenure and Structure type Single-family homeowners are less likely to move than renters living in multi-family dwellings. Therefore, mobility is negatively related to the owned single-family dwelling variable.
6. Education Highly educated people have more opportunities in the job market and will move more often in order to fulfill employment needs. These moves, as discussed in the review of the literature, are migratory in nature rather than being considered moves that are housing-related. Because the mobility variable in this dissertation includes both residential moves and migration, it is hypothesized that mobility is positively related to education.

Combining the hypotheses relating to residential mobility results in the following model:

$$P(\text{Residential mobility}) = f(\text{Age, time, months since a move, number of previous moves, owned single-family dwelling, education, bedroom deficit})$$

7. Differences in moves The variables that explain mobility vary from one move to the next as the family makes adjustments to meet its changing needs. Therefore, in the residential mobility model, the explanatory power of the independent variables will vary from one move to the next.

## CHAPTER II. PROCEDURES

This chapter includes a description of the data used in this dissertation and the statistical methods utilized in the analysis. A description of the mobility model is included and the variables used in the model are defined. The hypotheses concerning the relationships among the variables in the mobility model are given. The chapter concludes with a discussion of issues in the analysis of event history data and a description of probit analysis, the statistical procedure used in this dissertation.

## The Data

The data used in this analysis were gathered by researchers at Iowa State University and the University of Nebraska in 1977 as part of a regional research project (NC-128) designed to study the quality of life as affected by place of residence. A stratified random sample was drawn from the Omaha-Council Bluffs standard metropolitan statistical area and from four small nonmetropolitan communities in Iowa and Nebraska.

Of all the households interviewed for this project, only the ones with household heads who are or have been married are included in this analysis. After deleting households with never-married heads and those with incomplete life histories and other missing data, the final sample consists of 404 households. Only households with a female present at the time of the interview were included in this analysis. Of the original sample, 54 cases were eliminated because of missing data and 27 cases were

eliminated because there was no female present at the time of the interview.

The data about the household used in this analysis include the date of household formation (month and year of marriage); the number of individuals who are living or who have lived in the household and their relationships to the household head; and specific information about each person in the household, including date of birth, sex, marital status, education level, and, if applicable, date of departure from the household. The residential histories consist of the following information about the present dwelling and each of the previous dwellings the household has occupied: the date of the move to the residence, the county and state, as well as the type of community in which the residence was located, the tenure arrangements for each residence, the type of structure, the number of bedrooms, and whether the household made any additions or alterations to the dwelling during the term of residence.

With the type of analysis that is used in this dissertation, it is imperative that the information from each household be complete. If more than three major items were not reported in the life history data (for example, year of a move), the case was deleted. However, the cases with only one or two items of missing data were allocated.

The questionnaires were examined carefully so that any allocations that were made corresponded to all of the information that was on the questionnaire. For example, if the questionnaire showed that a move occurred in the spring, it was randomly assigned a number which corresponded to a spring month. Missing months for birthdates and moving

dates that had no clues as to the actual date were coded as a six which is the median of months in a year.

After the data had been cleaned and the missing data allocated, they were transformed into a longitudinal yearly record of each household's life, beginning at the date the household was formed. This form of data is typically referred to as event history data (Allison, 1982). It is structurally similar to biological assay data and can be analyzed using similar procedures (Gladhart, 1973; SAS Manual, 1982).

Each year of a household's history became a single observation. The first observation for each household begins with the date of the current marriage. Subsequent observations begin with the anniversary of the date of marriage. Each household contributed as many observations as the number of years the household had been in existence. That is, the households that had lived together for five years contributed five observations to the data base. Couples who had been married ten years added ten observations. A household consisting of a widow living alone contributed the number of years she and her husband had lived together as well as the years following his death. With women who had divorced and remarried, only the history of the present marriage was collected. In all, there were 10,028 segments from 404 respondents. The number of marriage-year segments contributed by any one particular household ranged from 1 to 71, with the average number of segments contributed being 18.36.

The observations contain the values of the condition and event variables that were collected from each household. Condition variables are the various states and stages that the household was in at the

beginning of each year such as length of residence, tenure, structure type, and bedroom deficit. The condition variables are of two types: 1) time-varying variables, or those which can vary from one year to the next like tenure or structure type of the current residence, and 2) variables that are constant over the life of the family such as education.

Education and age of the female at marriage are the only variables that are not time-varying variables used in the current analysis. The event variables are occurrences that take place during a year. They include increase or decrease in household size and residential mobility.

#### The Analysis of Life History Data in Mobility Studies

There have been many studies of factors that explain residential mobility, but only a few have utilized event history data. Morrison (1967) suggested that to study residential mobility, the history of each individual household be divided into short temporal segments to generate a large number of observations for contingency table analysis. With that method he analyzed migration patterns, using event history data gathered from registration files in the Netherlands. Since Morrison's (1967) study, a substantial social science literature has built up on methods of analyzing such event history data (Allison, 1982).

Because the dependent variable in mobility studies is dichotomous, researchers often view mobility as the probability that a family changed residences. Fredland (1974), using event history data from a 1960 survey done in the North Atlantic States, analyzed the probability of moving using standard multiple regression techniques. Morris (1977) used regression analysis with event history data to analyze the relationships



among mobility, fertility, and residential crowding. Carey (1979) used multiple regression with life history data to test a causal path model of residential mobility. Speare et al. (1974) used multiple classification analysis, a modification of dummy variable regression, in a study of residential mobility. Although regression analysis has been employed in several studies of residential mobility, its use is not recommended because of violation of the assumptions of multiple regression inherent in the use of a dichotomous dependent variable.

Gladhart (1973), using event history data, divided it into one-year segments and used probit analysis to explore the relationship between residential crowding and residential mobility. Russell and Rives (1979) used a multivariate probit model to describe household migration plans. Probit analysis was chosen for their study because it "permits a more rigorous specification of the relation of demographic, economic, and social factors to the individual migration decision" (Russell & Rives, 1979, p. 95).

In this dissertation, the observations which make up the time variable are divided into equal width intervals of one year in length. The interval within which a move occurs is the observable dependent variable rather than the exact time of the move. Although this procedure decreases the precision of the measurement of the mobility variable, it is not too restrictive as the width of each time interval (1 year) is small (Brown, 1975).

## The Variables

Two types of variables are included in each marriage-year segment: condition variables and event variables. Conditions that existed and events that took place in the year preceding each observation were also recorded for each marriage-year segment, as were the conditions and events observed in the year following each observation.

### The events variables

One event of interest, change in the household size, is used as an independent variable in the model to explain residential mobility. The change in household size is divided into two separate dichotomous variables: whether the household increased in size during the year and whether it decreased. For some specific analyses, increase in household size during the previous year is used. An increase in household size occurred in 9.8 percent of the observations and 6.2 percent reported a decrease in household size. An increase in household size in the preceding year was recorded in 10.1 percent of the observations. A decrease in household size in the preceding year was recorded in 5.9 percent of the observations. The dependent mobility variable is also considered an event variable and indicates whether a move occurred during a given year. A move occurred in 15.0 percent of all the observations.

### The condition variables

The condition variables include demographic characteristics of the wife in each household, months since a move, number of previous moves, a time factor, tenure and structure-type of the dwelling and residential

crowding. These variables were, for the most part, recorded as of the beginning of each marriage-year segment. Exceptions to this are the demographic variables: age of the wife at marriage and education of the wife are constant for all marriage-year segments contributed by any particular household.

The mobility history variables include the number of months since a previous move, number of previous moves, and order of the move. The number of months since a move measures how long, in months, the household had lived in its current dwelling. The mean for this variable is 88.3. The number of previous moves is a measure of chronic mobility with values ranging from 0 to 22. The mean for this variable is 3.2.

The ordinal number of the move indicated if it was a first, second, or subsequent move. Four categories were created: first move, second move, third move, and fourth or higher order move.

The total number of segments contributed by a household is an indication of the number of years since the formation of the household at the time the data were gathered. This variable is termed marriage cohort.

The time variable is based on which marriage-year segment is being observed for each household. In other words, the first segment from each household was given a value of one, the second segment was valued at two, etc.

The housing variables include information on structure, tenure, and residential crowding. Both structure and tenure were dichotomous dummy-coded variables. Structure type was coded one if the household was living

in a single-family dwelling and zero otherwise. With tenure, the households who owned their own home were assigned a score of one, while renters and households living rent free were coded zero. These two variables were multiplied to create the dummy variable "owned single-family dwelling". In 61.8 percent of the observations, the households own their residence. In 85.6 percent of the observations, the households live in single-family dwellings. In 58.9 percent of the observations, the households are single-family homeowners.

The bedroom deficit variable was calculated by subtracting the bedroom need score from the number of bedrooms in the family's current dwelling (Carey, 1979). The bedroom deficit score could be positive or negative. Burda (1979) and Crull (1979) used negative values of bedroom deficit in analyses that examined the relationship between housing needs and housing satisfaction. Having a deficient number of bedrooms was thought to be the most straightforward way of measuring bedroom deficit. Negative bedroom deficit is one of the major variables influencing housing satisfaction (Morris et al, 1976; Morris, 1976). Therefore, in this analysis, only the negative bedroom deficit values were of interest. That is, only the households that had fewer bedrooms than were needed were considered to be deficient in housing space. This was accomplished by creating a dummy variable which was coded one if the household had a negative bedroom deficit and zero if the household experienced either a positive bedroom deficit or no bedroom deficit.

### Problems in the Analysis of Life History Data

In the analysis of event history data, time is included in the model as either a continuous or discrete independent variable. Standard analytic techniques are not well-suited to event history analysis because the dependent variable used is an event which is dichotomous and is given a value of one if the event occurred within a given time period and zero if the event did not occur. As discussed previously, using a dichotomous dependent variable does not meet the assumptions of ordinary least squares regression analysis. The length of the observation, be it a year, a month, or a number of months is simply arbitrarily assigned as a cutoff point by the researcher. It is wasteful of information because it ignores the specific date during an observation that an event occurred.

Instead of using time as an independent variable as was done in this dissertation, some researchers have used time until an event occurs as the dependent variable in a multiple regression analysis. However, there are problems associated with that procedure as well. Some households in the sample might have never experienced the event during the period under study. For those observations, the measure of the dependent variable, time until an event occurs, would be the entire length of the time period under investigation. But because the event did not really occur in these households, this measure of the time variable is inaccurate. These observations cannot be regarded in the same sense as the rest of the sample, and yet to exclude them can affect the results.

Another problem in measuring time until an event occurs involves the inclusion of time-varying covariates as explanatory variables. For

example, suppose one were including an income variable in a model of mobility of a given sample over two years. The effect of income could be very different for the household that moved one month after the study began than for a household that moved one and a half years after the study began. In this analysis most of the time-varying variables are event variables which either occur or not during any particular observation. Therefore, the accuracy of their reported effect on the dependent mobility variable is not diminished because they are time-varying covariates.

A concern that is raised about the use of event history data divided into year segments is that the observations are not independent. Since each household contributes more than one marriage-year segment to the data, the assumption of independent observations is violated. However, several researchers (Morris, 1977; Carey, 1979; Allison, 1982) have employed life history data from the same household or source and have used it in multiple regression analysis as well as log-linear analysis, probit, and logistic regression. Using such data is an established practice and the results of the analyses employing such data are considered credible:

To implement the method..., the first step was to create a separate observation for each year that each person was observed (Allison, 1982, p.78). Is it legitimate to treat the multiple time units for each individual as though they were independent? In the example..., we started with 200 observations but ended up analyzing 848 observations. To some, this may appear to be an artificial inflation of the sample size, leading to statistics that are misleadingly high....The derivations...show that the estimation procedure proposed here is indeed the ML estimator for the corresponding model...the estimates possess the well-known properties of being consistent, asymptotically efficient, and asymptotically normally distributed (Allison, 1982, p.82).

A final concern in the analysis of life history data is the problem of censored observations. Data collected in the form of event histories are most often right-censored data. That is, any event which occurs after the cut-off point of the life history collected from each household is unobserved. Figure 1 (Tuma and Hannan, 1978) illustrates this problem. The period of observation lies between the two vertical lines at 0 and  $a$ . The dates at which an event such as a residential move occurred during the event history as indicated by the vertical lines between 0 and  $a$  and are denoted by  $t_i$ . In this example, the event occurs a fourth time. However, since the last event occurred after  $a$ , it is not observed. What is observed, though, is a period of time between  $t_3$  and  $a$  where an event does not occur. Thus, the data are said to be 'censored' on the right.

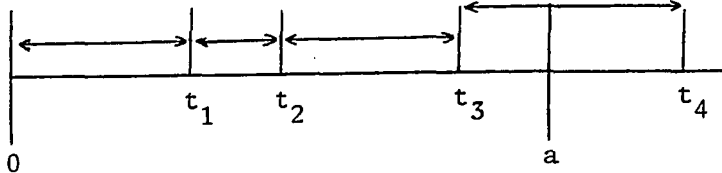


Figure 1. A typical event history

Some researchers opt to treat censored observations as though an event occurred at the time of the last observation (Tuma and Hannan, 1978). In this dissertation, censored observations were included in the analysis in the same form in which they were originally coded. That is, if a move occurred in the last marriage-year segment of a household, that observation was given a value of one in terms of mobility. If however, no move occurred in the last marriage-year segment of a household, the observation was coded as zero.

### Probit Analysis

Probit analysis is implemented when the model being tested has a dichotomous dependent variable. This variable could represent the occurrence of an event like a residential move. In this dissertation the dependent mobility variable, denoted by  $Y_n$ , is represented by a dichotomous random variable which takes the value of one if the event (a move) occurs and 0 if it does not occur.

The probit program can be interpreted much in the same way as ordinary least squares regression. Both programs provide estimates for each independent variable in the model being tested. For each estimate, corresponding t-ratios are listed which assist in determining the explanatory power of each independent variable in the model. The main difference between regression analysis and probit is that regression estimates give the actual value of the change in the dependent variable for each unit change in the independent variable, whereas, the probit estimates represent the amount of increase or decrease in the probability of an index associated with the dependent variable, given a unit increase in the independent variable.

To further clarify the probit model, suppose  $Y_n$  denotes the occurrence or non-occurrence of the event for the n-th observation in a sample size N. Further,  $X_n$  represents an independent variable measured on the n-th observation. The probability that the event occurred, that is,  $P(Y_n=1)$  depends on the value of  $X_n\beta$  where  $\beta$  is the estimate which parallels the  $\beta$  estimate of ordinary least squares regression. This equation can be interpreted to mean that if  $\beta$  is positive, the probability of an event



occurring increases as  $X_n$  increases. That is, the larger the value of  $X_n$ , the more likely the occurrence of the event. Conversely, if  $\beta$  is less than zero, the larger the value of  $X_n$ , the less likely the event is to occur.

Because the  $\beta$  estimate in probit analysis is actually a measure of probability, it is necessary to include an extra step in its calculation. Initially, an index is created which is equal in value to  $X_n \beta$ . This index is then transformed into a probability estimate (White, 1981), which represents the probability the event occurred, given the value of  $X_n$ .

In the case of multiple independent variables, probit analysis will derive a  $\beta$  estimate for each independent variable included in the model. These estimates can be either positive or negative. By examining the t-ratio derived for each probit estimate, it is possible to recognize which independent variables are making a significant contribution to the model. For a more detailed explanation of probit analysis, see Appendix I.

Probit analysis was used in this dissertation to test the hypothesized relationships between the independent explanatory variables and increase in household size, bedroom deficit and residential mobility. The probit program yields an estimate with an associated t-ratio for each explanatory variable in the model being tested. An  $r^2$  statistic between the actual and predicted values of the dependent variable is also produced by the probit program. The  $r^2$  is an estimate of the percentage of variation in the dependent variable that is explained by the independent variables. A final statistic found in probit analysis is the maximum likelihood ratio which measures how well the model being tested fits the data.

## CHAPTER III. ANALYSIS

In this chapter, the procedures used at each stage of the analysis are explained and the results obtained from each step in the analysis are reported. In the last section, the final model is presented with the hypothesized relationships that proved to be significant.

## Descriptive Analysis

Table 1 is a matrix of the correlation coefficients between all the pairs of variables included in this analysis. Some rather interesting results can be found when analyzing the correlation coefficients. First, the time variable is highly correlated with both of the mobility history variables. Time has a correlation coefficient of .60 with months since a move and .40 with number of previous moves. The positive relationship between time and months since a move is an indication of (1) that the longer the household remains together, the longer it stays in the current residence, and (2) the multicollinearity between time and length of residence. The results of the correlation between the time variable and the number of previous moves indicates that moves accumulate over time, which is to be expected. The longer the household has been formed, the more moves are accumulated. However, the relationship between time and months since a move shows that the time between moves becomes greater as time passes.

It is not surprising that the time variable shows a significant negative relationship with increase in household size both in the present

Table 1. Correlation coefficients of the variables included in the residential mobility model (N=9208)

	1	2	3	4	5	6	7	8	9	10	11
1. Age at marriage	1.00										
2. Education	-.24	1.00									
3. Time	.56	-.13	1.00								
4. Months since a move	.36	-.08	.60	1.00							
5. Number of previous moves	.15	-.09	.40	-.14	1.00						
6. Owned single-family dwelling	-.00	.03	.27	.24	.08	1.00					
7. Increase in household size last year	-.13	.06	-.27	-.17	-.13	-.12	1.00				
8. Bedroom deficit	-.01	-.03	-.12	-.10	.00	.09	-.03	1.00			
9. Mobility	-.13	.02	-.21	-.17	-.02	-.32	.12	.07	1.00		
10. Increase in household size	-.06	.06	-.28	-.18	-.13	-.10	.04	.10	.09	1.00	
11. Moved last year	-.06	.02	-.23	-.34	.09	-.20	.11	.01	.15	.13	1.00

\*Decrease in household size was omitted from this table. It had to be omitted from the analysis because it had such slight relationships to the key variables.

year and the previous year. The correlation coefficient was  $-.28$  for time and increase in household size in the present year and  $-.27$  for time and increase in household size in the previous year. Both correlations are negative which is an indication that most increases in household size occur in the early marriage years.

Both the number of months since a move and the time variable prove to have significant positive relationships with the tenure-structure dummy variable, owned single-family dwelling. These results indicate that single-family home owners are likely to remain in their residences longer than are renters or those who live in multi-family units. Although the correlations are not extremely large ( $.27$  for time and  $.24$  for months since a move), the results indicate that older households are more likely to be owners of single-family dwellings and owners are likely to remain a long time in the residence.

Residential mobility has significant correlations with only two of the exogenous variables, time and owned single-family dwelling. With the time variable, the correlation of  $-.21$  indicates that moving behavior is more prominent in the early years of marriage and decreases as the number of years the household is together increases. Time is also negatively correlated with the moved last year variable ( $-.23$ ). The  $-.32$  correlation between mobility and owned single-family residence can be interpreted as meaning that households occupying owned single-family dwellings are less likely to move than a household that lives in a rental unit or multi-family dwelling.

Owned single-family dwelling has a positive relationship (.24) with months since a move. This result leads to the conclusion that the households living in owned single-family dwellings have remained in the current residence longer than those who live in rented or multi-unit dwellings. -

Months since a move and the moved last year variable have a significant negative relationship (-.34). Because the moved last year variable is a record of moves that occurred in the previous year, the value of the months since a move variable associated with the moved last year variable would have to be small (less than 12). Therefore, a negative correlation between these two variables results.

Even though the correlation matrix shows some rather strong relationships between several pairs of the independent variables, there is little strong indication of multicollinearity because only correlations of about 0.80 can greatly affect estimation (Nie et al, 1975).

Table 2 shows an analysis of mobility rates differentiated by time and marriage cohort. Looking down the columns of the table reveals the mobility rates of each marriage cohort for five-year periods throughout time. For example, the right hand column (column a) gives the mobility rates of the cohort married before 1937. The first entry at the top of the column gives the probability of moving for that cohort during the first five years of marriage. The second entry gives the probability of moving during the second five years of marriage.

For each marriage cohort, the mobility rate declines as time passes.

Table 2. Mobility rates by time and marriage cohort (N=9208)

	Marriage cohort (categorized in 5-year intervals)								
	1 (72-76)	2 (67-71)	3 (62-66)	4 (57-61)	5 (52-56)	6 (47-51)	7 (42-46)	8 (37-41)	9 (<1937)
Time (in 5-year segments)									Years Included
1-5	.45 (157)	.36 (315)	.43 (215)	.27 (175)	.35 (185)	.29 (166)	.37 (200)	.32 (145)	.22 (405)
6-10		.20 (170)	.19 (215)	.14 (175)	.19 (185)	.20 (165)	.17 (200)	.23 (145)	.19 (405)
11-15			.10 (135)	.14 (175)	.06 (185)	.16 (165)	.17 (200)	.18 (145)	.14 (405)
16-20				.09 (104)	.07 (185)	.08 (165)	.11 (200)	.09 (145)	.12 (405)
21-25					.06 (102)	.09 (165)	.09 (200)	.06 (145)	.08 (405)
26-30						.09 (96)	.07 (200)	.07 (145)	.07 (405)
31-35							.03 (116)	.05 (145)	.06 (405)
36-40								.06 (80)	.05 (405)
41+									.05 (805)
Totals	.45 (157)	.31 (485)	.26 (565)	.17 (629)	.16 (842)	.16 (921)	.15 (1316)	.14 (1095)	.10 (4045)

For example, 1952-56 marriage cohort (column 5) includes all households that were formed between the years of 1952 and 1956. During the first five years these households were together, they had a mobility rate of .35. In other words, a move occurred in 35 percent of the observations represented. In years 6-10, the mobility rate for marriage cohort number 5 dropped to .19. By years 11-15, the rate of mobility had declined to .06, or 6 percent. Each marriage cohort shows a similar pattern of a relatively high mobility rate during the first years after household formation that steadily declines as time passes.

The mobility rates of each marriage cohort for specific 5-year periods of marriage is shown in each row of Table 2. The first row shows the mobility rate of each cohort during the first five years of marriage. An interesting phenomenon can be seen by looking across the first row. For the first five years, the mobility rate for the first marriage cohort is .45. For marriage cohort number 2, the mobility rate is somewhat lower, .36. However, the mobility is higher for marriage cohort number 3 (.43). It drops to .27 for the fourth marriage cohort. This pattern of a higher mobility rate of one cohort followed by a lower rate for the next cohort and then a higher rate for the following cohort is especially interesting, given the fact that the overall mobility rate has remained relatively constant over the last forty years.

To fully understand the implications of this fluctuating mobility rate, it is necessary to look at mobility rates of specific calendar years that are aligned diagonally in Table 2. These are the mobility rates for a 10-year time period associated with each marriage cohort. For example,

marriage cohort number 2 includes all households that were formed in the years 1967-1971. During the first five years of marriage, these households had a mobility rate of .36. However, this mobility rate was actually measured over a ten-year calendar period. The first five years of a household formed in 1967 include the years 1967-1972. The first five years of a household formed in 1971 include the years 1971-1976. Therefore, the mobility rate of .36 was based on calendar year observations between 1967-1976.

The mobility rates listed along the diagonal lines in Table 2 reflect the mobility for each marriage cohort during the dates that are listed in the last column of the table. The longest diagonal line of mobility rates represents mobility that took place during 1972-1976. Because the data were collected in 1976, no moving behavior that occurred after that year was available for analysis. Therefore, marriage cohort number 1 is associated with observations during a 5-year period rather than a 10-year period like all the subsequent marriage cohorts.

By comparing the mobility rates along the diagonal lines associated with 1972-1976 and 1967-1976, the phenomenon of fluctuating mobility rates between marriage cohorts can be used to explain the overall stability in residential mobility rates. In the years 1972-1976, marriage cohort number 1 had a relatively high mobility rate (.45). In comparison, between 1967 and 1975, marriage cohort number 2 had a mobility rate of .36, significantly lower in value than that of marriage cohort number 1. However, between 1967 and 1976, marriage cohort number 4 had a mobility rate of .14. This rate is somewhat higher than the comparable mobility



rate of .10 which is associated with marriage cohort number 3 in 1972 to 1976.

The pattern of mobility that emerges in Table 2 is that for any given calendar period, if the mobility rate for newly-formed households is high, the mobility rate for longer-established households will be lower than the previous mobility rates of longer-established households. If newly-formed households have a low mobility rate as compared to other newly-formed households in previous time periods, the rates of subsequent cohorts will be higher than similar cohorts in previous time periods.

The same pattern can be seen when comparing the mobility rates between 1962-1971 and 1957-1966. Between 1962 and 1971, newly-formed households had a mobility rate of .43. In comparison, newly-formed households had a mobility rate of .27 between the years 1957 and 1966. However, households that had been together for 11-15 years had a mobility rate of .06 in 1962 through 1971, but this same group had a mobility rate of .16 in 1957 through 1966. By taking an average measurement of the mobility rates along the diagonal lines in Table 2, an overall average mobility rate for each calendar period is derived. Because of the fluctuations between the subsequent marriage cohorts, the overall average mobility rate is about the same for each calendar period.

Mobility rates within each 5-year category of the time variable and marriage cohort tabulated by the number of previous moves was the next step in the analysis (Table 3). The older the household, the lower the mobility rate. When there are no previous moves, higher mobility rates are found in the most recent marriage cohorts. That is, the longer the

Table 3. Mobility rates by marriage cohort and number of previous moves (N=9208)

	Marriage cohort (categorized in 5-year intervals)								
	1 (72-76)	2 (67-71)	3 (62-66)	4 (57-61)	5 (52-56)	6 (47-51)	7 (42-46)	8 (37-41)	9 (<1937)
Number of Previous Moves									
0	.54 (85)	.31 (184)	.38 (107)	.20 (156)	.20 (175)	.21 (153)	.18 (211)	.17 (162)	.11 (746)
1	.41 (32)	.27 (120)	.30 (105)	.14 (154)	.18 (144)	.16 (164)	.21 (142)	.16 (128)	.10 (631)
2	.17 (29)	.25 (71)	.20 (122)	.14 (129)	.16 (140)	.13 (157)	.23 (125)	.24 (96)	.09 (603)
3	.50 (8)	.27 (44)	.20 (75)	.15 (61)	.08 (164)	.12 (114)	.10 (243)	.16 (114)	.10 (413)
4	1.00 (1)	.28 (32)	.26 (58)	.24 (38)	.27 (40)	.20 (70)	.13 (136)	.11 (154)	.10 (408)
5+	.50 (2)	.53 (34)	.19 (98)	.19 (91)	.13 (179)	.13 (263)	.13 (459)	.10 (441)	.11 (1180)
Totals	.45 (157)	.31 (485)	.26 (565)	.17 (629)	.15 (842)	.15 (921)	.15 (1316)	.14 (1095)	.10 (3981)

household has been formed, the lower the mobility rate. The same pattern is evident when there has been only one previous move. With two previous moves, the mobility rate remains relatively stable for all the marriage cohorts. When there have been three or more previous moves, the mobility rate is very high for the first marriage cohorts and then drops off sharply. For households that have moved the same number of times, the households that have been together longer will have lower mobility rates. However, the lower mobility rates associated with the earlier marriage cohorts lend support to the hypothesized negative relationship between residential mobility and time. Another conclusion that can be made from Table 3 is that mobility for each grouping of marriage cohorts does not change appreciably even if the number of previous moves increases.

Higher mobility rates are found within the earlier years of marriage (Table 4). The rates drop off sharply after about 10 years and remains at a fairly stable low rate from then on. There is a noticeable increase in mobility as the number of previous moves increases, especially during the earlier years of marriage. When there are no previous moves, the mobility rate in the first five years of marriage is .30. This figure increases to .39 for households with two or three previous moves and .44 for households with four previous moves.

When time is tabulated by number of previous moves while controlling on marriage cohort (Table 5), the highest mobility rates are still found in the years soon after the household was formed. For this comparison, both marriage cohort and the time variable were categorized into 10-year groupings. The first 10-year time category has the highest overall

Table 4. Mobility rates by time and number of previous moves (N=9208)

	Time (categorized in 5-year intervals)								
	1 (1-5)	2 (6-10)	3 (11-15)	4 (16-20)	5 (21-25)	6 (26-30)	7 (31-35)	8 (36-40)	9 (40+)
<b>Number of Previous Moves</b>									
0	.30 (1093)	.12 (294)	.06 (175)	.07 (118)	.01 (77)	.03 (63)	.02 (57)	.07 (44)	.07 (58)
1	.36 (458)	.15 (390)	.09 (229)	.07 (174)	.07 (113)	.06 (71)	.04 (49)	.03 (37)	.00 (99)
2	.39 (236)	.17 (327)	.12 (265)	.08 (167)	.08 (135)	.04 (108)	.05 (83)	.03 (58)	.03 (93)
3	.39 (108)	.22 (245)	.10 (214)	.07 (204)	.06 (167)	.05 (126)	.05 (65)	.00 (56)	.04 (51)
4	.44 (43)	.25 (173)	.20 (142)	.13 (119)	.07 (114)	.04 (103)	.04 (108)	.06 (78)	.11 (57)
5 or more	.42 (24)	.29 (231)	.21 (385)	.13 (419)	.09 (406)	.10 (365)	.07 (294)	.07 (202)	.06 (421)
<b>Totals</b>	.33 (1962)	.19 (1660)	.14 (1410)	.10 (1210)	.07 (1012)	.07 (836)	.05 (656)	.05 (475)	.05 (779)

Table 5. Mobility rates by marriage cohort, number of previous moves, and time (N=9208)

Time*	Marriage Cohort					
	1967-1976	1957-1966		1947-1956		
	(1-10)	(1-10)	(11-20)	(1-10)	(11-20)	(21-30)
Number of Previous Moves						
0	.39 (269)	.31 (229)	.03 (34)	.24 (254)	.09 (65)	.11 (9)
1	.30 (152)	.26 (195)	.05 (64)	.26 (163)	.06 (103)	.09 (42)
2	.23 (100)	.24 (152)	.06 (99)	.24 (109)	.09 (127)	.31 (61)
3	.31 (52)	.23 (83)	.09 (53)	.26 (76)	.04 (126)	.04 (76)
4	.30 (33)	.31 (58)	.16 (38)	.33 (42)	.23 (43)	.04 (25)
5 or more	.53 (36)	.17 (63)	.20 (126)	.29 (56)	.12 (236)	.09 (150)
Totals	.33 (1642)	.26 (1780)	.11 (414)	.26 (700)	.09 (700)	.08 (363)

\*in 10-year intervals

1937-1946				Before 1937				
(1-10)	(11-20)	(21-30)	(31-40)	(1-10)	(11-20)	(21-30)	(31-40)	(41+)
.24 (244)	.07 (71)	.05 (41)	.06 (17)	.17 (391)	.06 (123)	.00 (90)	.03 (84)	.07 (58)
.31 (122)	.13 (69)	.02 (59)	.10 (20)	.19 (216)	.08 (167)	.08 (83)	.01 (66)	.00 (99)
.13 (101)	.23 (56)	.06 (34)	.03 (30)	.24 (101)	.11 (150)	.05 (148)	.05 (111)	.03 (193)
.25 (100)	.09 (123)	.05 (109)	.00 (25)	.38 (42)	.12 (116)	.07 (108)	.03 (96)	.04 (51)
.22 (55)	.14 (106)	.07 (81)	.04 (48)	.32 (28)	.19 (74)	.05 (111)	.05 (138)	.10 (57)
.26 (68)	.15 (265)	.09 (366)	.05 (201)	.37 (32)	.23 (180)	.12 (270)	.09 (315)	.06 (447)
.27 (690)	.13 (690)	.07 (690)	.05 (341)	.21 (810)	.13 (810)	.07 (810)	.06 (810)	.05 (805)

mobility rate of .33. This group included all the observations from the households that were formed in the years 1967 to 1976. The first ten-year time category for each marriage cohort had the highest rate of all the time segment categories included in each marriage cohort. The second 10-year time category associated with each marriage cohort showed an appreciable drop in mobility in all cases. Mobility rates either increased or remained stable as the number of previous moves increased.

### Probit Analysis

#### Univariate probit analysis

To better understand the individual effect of each explanatory variable in the mobility model, a series of univariate probit analyses were conducted that tested the hypothesized relationships between residential mobility and the independent variables. The results of these analyses are shown in Table 6. Each model has one degree of freedom for the single independent variable. Four iterations were required to derive the maximum likelihood ratio for each simple model with the exception of the owned single-family dwelling variable, where only three iterations were necessary to produce the likelihood ratio statistic.

All of the independent variables have significant relationships with mobility when included in simple probit models. The time variable has a statistically negative relationship with mobility meaning that the probability of moving decreases as time passes. Age at marriage, months since a move, number of previous moves, and decrease in household size also have significant negative relationships. Bedroom deficit has a

Table 6. Univariate probit analyses of residential mobility on each of the independent variables (N=9208)

<u>Variable</u>	<u>Coefficients</u>	<u>Standard Error</u>	<u>t-ratio</u>	<u>Ratio Test</u>	<u>r<sup>2</sup></u>
Age at marriage	-.018	.01	-5.71*	34.53	.00
Time	-.033	.00	-22.88*	624.43	.07
Months since a move	-.004	.00	-18.87*	491.67	.05
Number of previous moves	-.025	.00	-4.86*	24.25	.00
Education	.025	.00	5.41*	29.35	.00
Owned single-family dwelling	-1.067	.03	-31.41*	1089.03	.11
Increase in household size	.561	.05	12.39*	147.87	.02
Decrease in household size	-.173	.07	-2.56*	6.77	.00
Bedroom deficit	.252	.04	6.70*	43.93	.00

\*Significant at the .05 level.



positive relationship with residential mobility indicating that the presence of a bedroom deficit increases the likelihood of a residential move. The relationship between education and mobility is positive and indicates that the higher the education level of the female household head the greater the probability that a move will occur.

Increase in household size had a significant positive relationship with residential mobility which can be interpreted as meaning that mobility is the result of an increase in the size of the household. Decrease in household size is significantly related to residential mobility.

The most statistically significant result from this portion of the probit analysis is the relationship between residential mobility and the owned single-family dwelling variable. The strong negative relationship indicates that homeowners of a single-family dwelling are less likely to move than renters or those living in multi-family dwelling units. The  $r^2$  for the effect of this variable on residential mobility is somewhat greater than the  $r^2$  for all the other variables.

#### Multivariate probit analyses

Change in household size Probit analysis was used to examine the relationships between changes in household size and the independent variables (Tables 7 and 8). It was hypothesized that a change in household size is a function of age, time, months since a move, number of previous moves, owned single-family dwelling, and education. Two separate models were tested using the probit program to examine these

Table 7. Probit analysis of increase in household size on event and condition variables (N=9208)

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<u>Variable</u>	<u>Coefficients</u>	<u>Standard Error</u>	<u>t-ratio</u>
Age at marriage	-.035	.00	-8.32*
Education	.009	.01	1.47
Time	-.065	.00	-13.39*
Months since a move	.000	.00	-.12
Number of previous moves	.003	.01	-.24
Owned single-family dwelling	.012	.04	-.29
Constant	.184	.12	1.51
Maximum Likelihood Ratio	1181.49		
Degrees of freedom	6		
r <sup>2</sup>	0.12		

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\*Significant at .05 level.

Table 8. Probit analysis of decrease in household size on event and condition variables (N=9208)

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<u>Variable</u>	<u>Coefficients</u>	<u>Standard Error</u>	<u>t-ratio</u>
Age at marriage	.009	.00	2.40*
Education	-.012	.01	-1.87
Time	.012	.00	5.56*
Months since a move	.000	.00	1.36
Number of previous moves	.024	.01	3.24*
Owned single-family dwelling	.117	.04	2.61*
Constant	-2.052	.12	-16.19
Maximum Likelihood Ratio	165.401		
Degrees of freedom	6		
r <sup>2</sup>	0.01		

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\*Significant at .05 level.

relationships: one using increases in household size and the other, decreases in household size.

Only two of the independent variables, age at marriage and time, make any significant contribution to the model explaining increases in household size. Both age at marriage and time have strong negative relationships with the increase variable. Together, the two independent variables represent 12 percent of the variance of increase in household size. The estimates for these two variables leads to two conclusions. First, the greater the age is at marriage the less likely the household is to increase in size. Second, as time passes, an increase in household size is less likely.

The model used to explain the decreases in household size has four variables that exhibit significant relationships: age at marriage, time, number of previous moves, and owned single-family dwelling. The  $r^2$  for this model is very low (.01) meaning the independent variables did very little to explain the variation in decreases in household size. The significant relationships indicate that decreases in household size are found in later marriage years, that decreases occur in households where the age of the female head is greater at the time of marriage and that as the number of previous moves increases, household size decreases. Also, households which live in an owned single-family dwelling have a greater probability of having a decrease in household size.

The results of this portion of the probit analysis do not support all of the hypothesized relationships between increase and decrease in household size and the independent explanatory variables. Rather,

increases in household size appear to be significantly related to only two of the independent variables: age at marriage and time. Although decreases in household size exhibit a significant relationship with four of the independent variables, the overall explanatory power of the model is very low. Therefore, decreases in household size was eliminated in further analysis.

Bedroom deficit analysis Table 9 shows the results of a probit analysis that examines a model explaining bedroom deficit. The hypothesis being tested in this analysis is that bedroom deficit is a function of age at marriage, education, time, months since a move, number of previous moves, increases in household size, and owned single-family dwelling. In this model, increase in household size last year is used as the change in household size variable due to the nature of the bedroom deficit variable. Observations that were coded as having a bedroom deficit included only the yearly segments in which the households lacked adequate bedroom space based upon a bedroom need index. An increase in household size, then, would be considered as an appropriate explanatory variable for a bedroom deficit variable like the one used in this analysis. Because the first observation in each household lacked information about the previous year's events and conditions, these observations were omitted from this portion of the analysis. This omission resulted in a reduced sample size of 9208.

This portion of the analysis resulted in a number of significant relationships with the bedroom deficit variable. Although the overall explanatory power of the model is somewhat low, ( $r^2=.04$ ) every variable included in the model has a significant t-ratio with the exception of

Table 9. Probit analysis of bedroom deficit on various independent variables, including increases in household size during the previous year (N=9208)

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<u>Variable</u>	<u>Coefficients</u>	<u>Standard Error</u>	<u>t-ratio</u>
Age at marriage	-.02	.00	-6.05*
Education	-.05	.00	-10.77*
Time	-.02	.00	-9.73*
Months since a move	.00	.00	-1.46
Number of previous moves	.02	.01	3.53*
Increase in household size last year	-.01	.00	-7.86
Owned single-family dwelling	-.12	.03	-3.74*
Constant	.43	.10	4.61
Maximum Likelihood Ratio	425.318		
Degrees of freedom	7		
r <sup>2</sup>	0.04		

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\*Significant at .05 level.

months since a move. The coefficients show that age at marriage, education, time, increase in household size last year, and owned single-family dwelling are negatively related to bedroom deficit. The number of previous moves is positively related to bedroom deficit. The large likelihood ratio is an indication that the independent variables are making a significant contribution to the explanation of bedroom deficit, however, overall the model does not fit the data well.

The greater the age at marriage, the less likely a bedroom deficit will occur. Households in which the female has attained a higher educational level are less likely to experience a bedroom deficit than households where the female has less education. A bedroom deficit occurs less frequently in later marriage year segments. Households living in an owned single-family dwelling are not as likely to have a bedroom shortage. The longer a household resides at a particular residence, the more likely that household will experience a bedroom deficit. The number-of-previous-moves variable had a strong significant relationship with bedroom deficit meaning that bedroom deficits can be associated with households that undertake a large number of residential moves.

Perhaps the most surprising result of this analysis was the relationship between increases in household size and bedroom deficit. It was hypothesized that changes in household size would bring about a bedroom deficit. That is, increases in household size and the bedroom deficit variable should be positively related. However, the results of this probit analysis indicate that increases in household size and bedroom deficits are negatively related, meaning that an increase in the size of

the household does not bring about a bedroom deficit. This finding may be related to the timeliness with which residential mobility occurs.

An identical probit model (Table 10) was tested with the exception that an additional variable which measured the moving behavior in the previous year was included in the model. With this model all of the coefficients are significant. The increase-in-household-size variable had a positive relationship with the deficit variable meaning that an increase in the size of the household during the previous year causes the household to experience a bedroom deficit during the present year. The negative relationship between mobility the previous year and bedroom deficit indicates that a move occurs after an increase in household size which eliminates the deficit in some households. Therefore, the hypothesized relationship between increases in household size and bedroom deficits is supported by these data, however, there is a lag between the increase in the size of the household and the bedroom deficit that is experienced by the household. Further, households that move quickly after an increase in household size do not experience a bedroom deficit.

Residential mobility analysis      A number of mobility models with various combinations of explanatory variables were tested using probit analysis on a subsample of 1000 observations. Several transformations of the time variable were tested as an explanatory variable in the mobility model. The log of the time variable and the squared value of the time variable were tested to discover whether a curvilinear relationship exists between time and residential mobility. However, neither of these transformations yield significant results in the residential mobility



Table 10. Probit analysis of bedroom deficit on event and condition variables, including mobility in the previous year (N=9208)

---

<u>Variable</u>	<u>Coefficients</u>	<u>Standard Error</u>	<u>t-ratio</u>
Age at marriage	-.017	.00	-5.75*
Education	-.051	.00	-10.86*
Time	-.018	.00	-9.16*
Months since a move	-.001	.00	-2.52*
Number of previous moves	.026	.01	4.13*
Increase in household size last year	.242	.03	7.05*
Moved last year	-.250	.03	-7.29*
Owned single-family dwelling	-.139	.03	-4.32*
Constant	.428	.10	4.57
Maximum Likelihood Ratio		478.920	
Degrees of freedom		8	
r <sup>2</sup>		0.04	

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\*Significant at .05 level.

model.

The time variable was also dummy-coded and included in a mobility model to see whether mobility was significantly different for different time periods. Time was differentiated into five ten-year groups that represented five different time periods throughout the life history of each household. These periods included: 1) years 1-10; 2) years 11-20; 3) years 21-30; 4) years 31-40; and 4) year 41 or higher. The t-ratios associated with the estimates of the dummy variables in this portion of the analysis are not significant, and so time was left in its original continuous form for the remainder of the analysis. Two models with residential mobility as the dependent variable were tested using probit analysis. The first included all the independent variables that were hypothesized to have a significant relationship with mobility. The second model also includes increase in household size. Although no hypothesis was developed which associated an increase in household size directly with residential mobility, the results of the analysis of the bedroom deficit models lead to the conclusion that an increase in household size and mobility could be related. However, when included with all the other independent variables, increase in household size added very little to the explanatory power of the residential mobility model. Apparently the effect of increased mobility is indirect through its effect on bedroom deficits. Therefore, the results reported in Table 11 include only the variables from the first model tested.

All of the variables except months since a move showed very strong significant relationships with residential mobility. The strongest

Table 11. Probit analysis of residential mobility on  
the independent variables (N=9208)

<u>Variable</u>	<u>Coefficients</u>	<u>Errors</u>	<u>t-ratios</u>
Age at marriage	-.014	.00	-4.27*
Education	.017	.01	3.24*
Time	-.025	.00	-9.90*
Months since a move	-.000	.00	-1.21
Number of previous moves	.038	.01	5.20*
Bedroom deficit	.131	.04	3.18*
Owned single-family dwelling	-.893	.04	-24.33*
Constant	-.258	.10	-2.50
Maximum Likelihood Ratio	1413.59		
Degrees of freedom	7		
$r^2$	.16		

\*Significant at the .05 level.

relationship appears to be with owned single-family dwelling. As hypothesized, those who own a single-family home are much less likely to move than those with other tenure arrangements or structure types. The large t-ratio of 24.33, along with the consistent significance this independent variable has shown throughout this analysis, indicates that tenure and structure are extremely important variables in this mobility model and account for the greatest share of the explained variance in residential mobility.

Age at marriage had a significant negative relationship with residential mobility, meaning those who postpone marriage until a later age are less likely to move than those who marry at a younger age. This result supports the hypothesized relationship between age at marriage and residential mobility.

Education proved to be significantly related to residential mobility. This positive relationship indicates that highly-educated people are more inclined to change residences than those with less education. This result also supports the hypothesized relationship between these two variables.

The time variable included in this model had the second largest t-ratio, meaning time plays an important role in explaining the variance of residential mobility. The negative relationship is an indication that most moves occur in the early marriage years and become less frequent as time passes.

Bedroom deficit, or lacking sufficient bedroom space, was also significantly related to residential mobility. However, the influence

bedroom deficit has on mobility is not well-defined as evidenced by the t-ratio of only 3.18. The positive estimate of bedroom deficit in this model means that mobility is more likely to occur in households that experience a bedroom deficit. This result supports the hypothesized relationship between bedroom deficit and residential mobility.

An interesting result of this portion of the analysis involved the relationship between residential mobility and number of previous moves. The t-ratio of 5.20 indicates a significant positive relationship between the two variables. The significant t-ratio for number of previous moves indicates that the greater the number of previous moves, the more likely a move will occur. This result supports the hypothesized relationship between mobility and the number of previous moves.

Another surprising result of this probit analysis is the apparent lack of a significant relationship between mobility and months since a move. These two variables were hypothesized to be negatively related, and the univariate analysis of this analysis showed the potential that a significant relationship existed between months since a move and mobility. However, the insignificant t-ratio associated with months since a move is evidence that this is not the case. It would appear that the effect of months since a move is indirect through bedroom deficit.

The  $r^2$  statistic for the mobility model is .16, indicating that 16 percent of the variance in the dependent mobility variable is explained by the model. Therefore, it can be concluded that there is still a great deal of variance in mobility from one observation to another that is not explained by the independent variables included in the model presented in

this dissertation.

Interaction effects In the review of literature, several mobility studies were cited that included interaction terms involving tenure. In this analysis, the tenure-structure variable had a strong significant effect in the mobility model tested. Therefore, two interaction variables were created that included owned single-family dwelling as one of the components in each interaction term. The interaction variables were included in the mobility model one at a time, and probit analysis was used to test whether including each of the interaction variables improved the explanatory power of the model.

Table 12 shows the results of the probit analysis that tested the mobility model including the independent variables hypothesized to be related to residential mobility and an interaction variable between time and owned single-family dwelling. The explanatory effects of the independent variables are similar to those in the original mobility model tested and the interaction term has a significant positive relationship with residential mobility. The conclusions of this analysis are that renters have a higher mobility rate than single-family homeowners and mobility rates for both owners and renters decrease as time passes. However, the mobility rate for renters decreases at a faster rate than the mobility rate of homeowners.

The second interaction term included in the mobility model combined the effects of the tenure-structure variable with months since a move. The results of the probit analysis of this model are shown in Table 13. The independent variables have the same explanatory power as in the

Table 12. Probit Analysis of the residential mobility model  
including an interaction of time and owned single-family  
dwelling (N=9208)

<u>Variable</u>	<u>Coefficients</u>	<u>Errors</u>	<u>t-ratios</u>
Age at marriage	-.014	.004	-3.88*
Education	.019	.005	3.44*
Time	-.026	.003	-9.68*
Months since a move	-.000	.000	-1.14
Number of previous moves	.041	.007	5.40*
Bedroom deficit	.136	.043	3.18*
Owned single-family dwelling	-1.055	.081	-13.02*
Time*owned single-family dwelling	.005	.002	2.38*
Constant	-.302	.112	-2.71
Maximum Likelihood Ratio	1222.59		
Degrees of freedom	8		
r <sup>2</sup>	.15		

\*Significant at the .05 level.

Table 13. Probit analysis of the residential mobility model  
including an interaction of months since a move and  
owned single-family dwelling (N=9028)

<u>Variable</u>	<u>Coefficients</u>	<u>Errors</u>	<u>t-ratios</u>
Age at marriage	-.014	.00	-4.10*
Education	.016	.01	3.01*
Time	-.023	.00	-9.90*
Months since a move	-.002	.00	-4.52*
Number of previous moves	.038	.01	5.00*
Bedroom deficit	.130	.04	3.05*
Owned single-family dwelling	-1.080	.05	-21.79*
Months since a move*owned single-family dwelling	.003	.00	6.06*
Constant	-.198	.00	-1.76
Maximum Likelihood Ratio	1254.18		
Degrees of freedom	8		
r <sup>2</sup>	.16		

\*Significant at the .05 level.



original mobility model with the exception of months since a move. In the original main effects model, months since a move did not have a significant relationship with residential mobility. With the inclusion of the interaction term that combines months since a move and owned single-family dwelling, the months since a move variable exhibits a strong negative relationship with mobility. The interaction variable has a significant positive relationship with residential mobility.

The results of this portion of the analysis lead to the conclusion that the likelihood of moving declines the longer the household remains in the current residence. Although the likelihood of moving is initially greater for renters than owners of single-family dwellings, the mobility rates of both groups become similar as length of residence increases.

Differentiation of moves analysis In all the previous mobility models tested in this dissertation, it was assumed that the variables that explained the variance in residential mobility were the same for all the moves that occurred. In the final portion of this analysis, that assumption was relaxed. The dependent mobility variable was categorized into 4 different groups, each representing a different ordered move. Each of these ordered move variables was treated as the dependent variable to see how the independent variables varied in their explanation of the first move, second move, third move, and fourth or higher move. A similar technique was implemented by Hofferth (1983) in a study which compared income and labor force participation with the occurrence of a birth. In that analysis, births were differentiated using the initial parity of the couple into first birth, second birth, third birth, and fourth or more

births.

Results of the probit analyses on the four models tested are given in Table 14. It is interesting to note the changes in the coefficients for the independent variables in each of the four models. In model one, the dependent variable is the first move and all the coefficients are statistically significant with the exception of the bedroom deficit coefficient. In model two which includes the second moves as the dependent variable, bedroom deficit is significantly related to mobility, but the coefficient for age at marriage is not significant. Both bedroom deficit and age at marriage drop out of Model 3 as neither is significantly related to the third move. With moves beyond the third move, only two of the independent variables, owned single family dwelling and the time variable, show any statistical significance in the mobility model. The changes of the estimates from one model to the next show how the explanatory variables for mobility change from one move to the next.

Time is negatively related to mobility in all four models which indicates that moving behavior consistently occurs in the early marriage year segments. Mobility is more prevalent in households which are newly-formed rather than those that have been established for a long period of time. Because time is negatively related to mobility in Model 4, most moves occur in the early marriage years, even in households that move more than 3 or 4 times.

Another variable which was statistically significant in all four models was owned single-family dwelling. As in the previously tested mobility model, the results indicate that households residing in an owned

Table 14. Comparison of estimates for four probit models predicting the probability of moving the first, second, third and fourth time.

<u>Independent Variables</u>	<u>Model 1</u> <u>First Move</u>		<u>Model 2</u> <u>Second Move</u>		<u>Model 3</u> <u>Third Move</u>		<u>Model 4</u> <u>Fourth Move</u>	
	Est.	t-ratio	Est.	t-ratio	Est.	t-ratio	Est.	t-ratio
Age at marriage	-.02	-3.24*	-.01	-1.75	-.01	-1.97	-.01	-1.36
Education	.04	3.59*	.02	2.50*	.02	2.56*	.00	-.06
Time	-.03	-5.79*	-.04	-9.66*	-.02	-5.34*	-.02	-9.15*
Bedroom deficit	.17	1.82	.15	2.18*	.09	1.27	1.0	1.65
Owned single family dwelling	-.88	-9.11*	-.45	-6.63*	-.69	-9.16*	-.88	-17.11*
Constant	-.53	-2.66	1.35	-7.58	-1.50	-8.11	-.05	-.27
Maximum Likelihood Ratio	298.389		324.492		219.498		523.128	
Degrees of freedom	5		5		5		5	
r <sup>2</sup>	.15		.04		.02		.13	
n	372		254		211		613	

\*Significant at the .05 level.

single-family home are less likely to move than the households living in rental housing or multi-family dwellings.

Education of the female head is a statistically significant predictor of mobility for the first, second, and third moves. However, beyond the third move, education has almost no explanatory power. The positive relationship between education and mobility indicates that higher rates of mobility can be associated with households where the female head has attained a high educational level. With age at marriage, an opposite pattern is revealed in the analysis of these four models. In Model 1, age of the female head at marriage is negatively related to the first move, meaning that the greater the age at marriage, the less the likelihood of moving. Model 1 is the only model, though, where age at marriage has a significant t-ratio.

The most interesting result of this analysis involves the relationship between bedroom deficit and the ordered mobility variables. In Model 1, bedroom deficit is not significantly related to the first move. However, in Model 2, bedroom deficit has a statistically significant t-ratio indicating that bedroom deficit is positively related to the second move. However, Model 2 is the only one where bedroom deficit exhibits any significant explanatory power. In models 3 and 4, bedroom deficit is not significantly related to subsequent mobility.

By examining the significant relationships in these four mobility models a scenario of a household's moving behavior over time can be constructed. During the early years of the marriage, a young couple will make their first residential move. This move could be migratory in nature

because of a new job opportunity, however, it is more likely that the couple or young family is moving out of a rental housing situation into their first owned home.

Within the next few years the family will move again. However, with the second move, space needs become a major consideration. Perhaps by this time the family size has increased with the addition of one or more children, and so the family will move to accomodate the new housing needs created by an expanding family.

Tenure and structure are still important considerations for those households making a second, third, or fourth move. In all of the models it appears that it is primarily the renters who are making residential moves. If the family does not move into a home of their own in their first move, they will likely do so in a subsequent move.

The third move appears to be strongly related to education, which characterizes this move as being job or status related. The housing might be satisfactory for these movers, but they change residences because of expanded economic opportunities or a change in employment. Therefore, the third move may be migratory in nature.

The households that move more than three times have probably lived in a number of different rental units, and their fourth move is into an owned single-family dwelling. The tenure structure variable is the only variable (with the exception of time) that has a significant relationship with fourth or higher moves.

The significant negative relationship between time and residential mobility in all four models indicates that all of this moving behavior takes place in a relatively short period of time. It characterizes the households as making several moves in the early years of marriage for a variety of reasons, and then settling down in an owned single-family dwelling for their remaining years together.

Throughout this analysis, the coefficients for each independent variable have been used as the unit of analysis and the corresponding t-ratios have been examined to determine whether each variable contributes significantly to the mobility model. A second dimension of the model that should be evaluated is goodness of fit. The SHAZAM program offers a coefficient,  $r^2$ . This  $r^2$  statistic measures the relationship between the actual and predicted values of the dependent variables. However, the concept of  $r^2$  as a measure of goodness-of-fit loses some of its meaning when the dependent variable is dichotomous, as in the case of residential mobility.

A more reliable statistic to consult when examining goodness-of-fit is the log-likelihood ratio test. The purpose of this test is to determine whether the model with the explanatory variables is significantly better than the model incorporating only a constant term. The likelihood ratio test reported for each model is computed by taking the logarithm of the generalized likelihood ratio test statistic. When the log-likelihood ratio is multiplied by -2, the result is the likelihood ratio test which is distributed as a chi-square with degrees of freedom equal to the number of independent variables in the model.

The examination of the likelihood ratio test for the mobility model confirms that the independent variables are making a significant contribution to the explanation of residential moving behavior. Moreover, the large value of the likelihood ratio leads to the conclusion that the probability of a larger value in the appropriate chi-square distribution is very small. In general, the likelihood ratio tests for the models discussed in this dissertation can be interpreted to mean that the variables are making significant contributions to the explanation of the dependent variable, although the overall fit of the data to the model is not that good.

A number of specific hypotheses relating changes in household size, bedroom deficit, and residential mobility to various explanatory variables were developed and tested in this dissertation. The following is a list of those hypotheses along with the conclusions from the analysis.

#### Tests of Hypotheses

Change in household size The hypothesized model explaining change in household size included six explanatory variables: age, time, months since a move, number of previous moves, owned single-family dwelling, and education. The results of this analysis showed that an increase in household size is significantly related to only two independent variables: age and time. Both of these relationships were negative. Decrease in household size is positively related to four variables: age, time, number of previous moves, and owned single-family dwelling.

Bedroom deficit Bedroom deficit was hypothesized to be explained by

seven independent variables: change in household size, age, time, months since a move, number of previous moves, owned single-family dwelling, and education. The final bedroom deficit model showed significant relationships with all of these variables with the addition of one more explanatory variable: mobility in the previous year. Bedroom deficit was hypothesized to be positively related to increases in household size. Results of this analysis support this relationship.

Residential mobility There are seven hypotheses about the effects of the independent variables on residential mobility:

1. Age at marriage Residential mobility and age at marriage were hypothesized to be negatively related. This relationship is supported by the significant negative relationship between mobility and age at marriage in the mobility model.
2. Time In this dissertation, it was hypothesized that mobility and time were negatively related. Results of the analysis support this hypothesis.
3. Months since a move Months since a move was hypothesized to be negatively related to residential mobility. Although the results of this analysis indicate that these two variables are negatively related, the relationship is not significant. Therefore, this hypothesis is not supported.
4. Number of previous moves A positive relationship was hypothesized between residential mobility and number of previous moves, and the results of the analysis support this hypothesis.
5. Tenure and structure type Mobility was hypothesized to be negatively related to owning a single-family dwelling, and this relationship was



supported by the results of this analysis.

6. Education The relationship between mobility and education was hypothesized to be positive. The results of this analysis reveal a significant positive relationship between these two variables.
7. Differentiation in moves In this dissertation, it was hypothesized that the explanatory power of the independent variables would differ with each subsequent move. This hypothesis was supported by the results of the analysis. Different independent variables have significant relationships with the various ordered mobility variables.

## CHAPTER IV. IMPLICATIONS AND CONCLUSIONS

In this dissertation, an attempt is made to discover variables which could be considered good empirical predictors of residential mobility. Using the Morris and Winter model of housing adjustment as a theoretical base, variables were developed which measure household demographic characteristics and composition, normative housing deficits, and residential mobility. The results of this analysis support the Morris and Winter model and give indication that certain events and conditions are significantly related to a household's actual moving behavior. Also, this study raises some questions that suggest further research is needed in the area of residential mobility.

The results of this analysis clearly show that time, itself, is an important indicator of residential mobility, but that the time frame between an event which produces a deficit and the eventual response to that deficit (moving) is not yet well-understood. Subsequent research is necessary to examine the relationship of household conditions and events with residential moving behavior over time.

An important discovery made in this dissertation was that the independent variables used in the mobility model had differing effects on actual mobility, depending on whether it was a first, second, or subsequent move. When the moves were categorized into the first, second, third move, and fourth or more move the independent variables differed in their explanations of the different moves. Owned single-family dwelling was statistically significant in all the mobility models which

substantiates the importance of tenure and structure norms in all moving behavior. Bedroom deficit only has a significant relationship with the second move, meaning that space considerations do not usually prompt a household's initial move, but are more important in the explanation of a second move.

The fact that the same variables were not consistently significant in all four models points to the conclusion that different models with different explanatory variables are necessary to explain the differentiation in moving behavior. The idea of categorizing mobility is very unique in the field of housing research. The results of this analysis act as a foundation for subsequent mobility research which attempts to find more and better explanatory variables for different moves. Also, further research is necessary to more completely understand time frames between moves and how they relate to residential moving behavior.

Peter Rossi (1980) is of the opinion that because residential mobility has remained relatively stable during the last forty years, there is little reason to investigate this phenomena at the household level. He states:

Since there is little evidence that a large number of residential shifts has any negative (or positive) impact on a household or individual, there seems little reason to look to the individual or household level for clues for the answer (p. 32).

Although the negative impact of mobility on individual households appears to be minimal, the actual explanation of moving behavior is

closely related to the perception of individuals and families on how well their housing meets their current needs. In this dissertation, evidence was given to support the idea that households move in response to normative housing deficits, especially deficits with regard to space, tenure, and structure. Moreover, mobility behavior is explained by different independent variables, depending on whether it is a first, second, or subsequent move. These results show that residential mobility does, indeed, have an impact on individuals and families. Mobility is one (and, in some cases, the only) alternative available to households in their striving to meet the housing norms prescribed by society and eventually to achieve housing satisfaction. The fact that until now mobility rates in this country have remained constant over the last forty years despite changes in population composition, the economy, and the social climate further substantiates the justification of looking at mobility at the household level. Perhaps by examining the household's moving behavior as a means of obtaining a satisfactory dwelling place, compensating mechanisms that have stabilized mobility rates amidst the changing macro-environment can be discovered.

Recent census data have revealed for the first time since 1940 a significant decline in residential mobility. Both sociological and economic reasons have been given to explain this phenomenon. First, an increase in the numbers of homeowners in this country have stabilized the population in terms of moving behavior, and the overall mobility rate has declined. Second, increases in the cost of homes and in mortgage interest rates has reduced the local mobility rate. These recent census findings, as well as the results of this analysis, have some rather important

implications in terms of policy.

As policymakers work toward alleviating the social problems related to housing, an essential consideration is the fact that society has prescribed certain cultural norms regarding what is good, right, and acceptable housing. Individual households will use whatever resources they have available to acquire housing that meets these cultural norms providing other important needs are also met. One of the most important ways to achieve acceptable housing is through residential mobility.

Future housing policy needs to reflect the "fit" among current housing conditions, housing norms, and the current population make-up. Policymakers need to be aware of the reasons why households are moving from one dwelling to another, and then develop policy which will help accomodate these households in their search for housing which meets their particular needs.

Another important consideration of policymakers is the recognition that the mobility process is an essential one, and that individuals and families willingly uproot themselves and seek better housing alternatives. Housing policy, then, should not be developed which would limit this mobility process. Rather, policy should be aimed at increasing the supply of housing that better accomodates family needs and which complies with the cultural housing norms of this country.

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## APPENDIX

The major statistical test used in this analysis will be probit analysis. Probit is implemented when the problem being investigated involves a model describing the probability of an event (such as residential move) occurring. This event, denoted by  $Y_t$  is represented by a dichotomous random variable which takes the value of one if the event occurs and 0 if it does not occur.

The probability that an event occurred, that is,  $P(Y_t=1)$  depends on the value of  $X_t\beta$  where  $X_t$  represents an independent variable measured on the  $t$ -th observation and  $\beta$  is an unobserved parameter which gives a estimated numerical value of the relationship between the independent variable and an index  $I$  representing the dependent variable. This relationship between  $Y_t$  and  $X_t$  can be denoted as follows:

$$P(Y_t=1) = P(Z_t / X_t \beta)$$

where  $Z_t$  is a standard normal random variable. This equation can be interpreted to mean that if  $\beta$  is positive, the probability of an event occurring increases as  $X_t$  increases, that is, the larger the value of  $X_t$ , the more likely the occurrence of the event. Conversely, if  $\beta$  is less than zero, the larger the value of  $X_t$ , the less likely the event is to occur.

Probit analysis has been used in models with discrete dependent variables (Hanushek & Jackson, 1977). The probit model is one of two popular specifications of the linear probability model involving the use of cumulative probability functions. The other is logit analysis. The

probit model is based on the cumulative normal distribution and the logit model is based on the cumulative logistic distribution (Russell and Rives, 1979). Because the maximum likelihood estimator for the two approaches is similar, the choice between logit and probit is largely one of convenience and program availability (Hanushek & Jackson, 1977).

In the probit model, an Index  $I$  is created which is a function of one or more exogenous variables as the following model shows:

$$I_t = X_t \beta$$

where the parameter  $\beta$  of the index is the same for all observations and is a linear estimate which describes the amount of increase in the Index  $I$  that is associated with a unit increase in the independent variables (Dwyer, 1983). This index value ( $I_t$ ) is unobserved. According to White (1981):

The Index  $I$ , which has a range from minus infinity to plus infinity, is then translated to a 0-1 range by the use of the cumulative normal distribution. Therefore an  $I=0$  would be translated to a .5 probability and the regular cumulative normal table can be used to interpret various values of  $I$ . Clearly, while the Index  $I$  is a linear function of the  $X$ 's, the probabilities are not; therefore, the coefficients must be interpreted carefully (p. 58).

With probit analysis, it is assumed that the probability of the dependent variable occurring or not ( $Y_t=1$  or 0) depends upon a threshold that is specific to each observation. This threshold is unobserved and takes on a different value for each value of  $X$ . The value of  $Y_t$  is then defined by the following model of behavior:

$$Y_t = 1 \text{ if } I_t \geq U_t$$

$$Y_t = 0 \text{ if } I_t < U_t$$

If all the  $U_t$  are normally distributed with the same mean and variance, it is possible to estimate the parameters of the underlying index. By standardizing the unobserved parameters (dividing both  $\beta$  and  $U_t$  by  $\sigma$ ), a new model is generated:

$$Y_t = 1 \text{ if } \frac{X_t \beta}{\sigma} \geq \frac{U_t}{\sigma} \text{ or } X_t \beta^* \geq U_t^*$$

$$Y_t = 0 \text{ if } \frac{X_t \beta}{\sigma} < \frac{U_t}{\sigma} \text{ or } X_t \beta^* < U_t^*$$

where the asterisks indicate the standardized values. If it is assumed that the threshold variable  $U_t$  has a mean of zero,  $U_t^*$  is distributed normally with a mean of zero and variance of one.

To derive the probability of the occurrence of the event measured by the dependent variable, the normal distribution is substituted into the standardized model and the following equations are obtained:

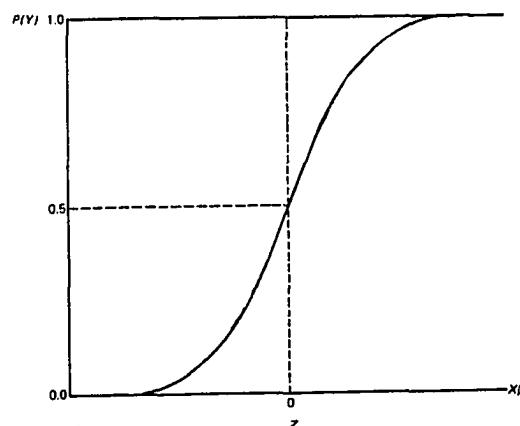
$$P_t = \text{Prob}(Y_t=1) = \text{Prob}(X_t \beta^* > U_t^*) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{X_t \beta^*} e^{-U^{*2}/2} dU^* = F(X_t \beta^*)$$

and

$$1 - P_t = \text{Prob}(Y_t=0) = \text{Prob}(X_t \beta^* < U_t^*) = 1 - \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{X_t \beta^*} e^{-U^{*2}/2} dU^* =$$

$$\frac{1}{\sqrt{2\pi}} \int_{X_t \beta^*}^{+\infty} e^{-U^{*2}/2} dU^* = 1 - F(X_t \beta^*)$$

Under these conditions, the relationship between the probability of the event described by the dependent variable and the unobserved index  $I$  takes the form in the diagram below:



The likelihood function of the sample is written:

$$L = \text{Prob}(Y_1, Y_2, Y_3, \dots, Y_T) = \prod_{t=1}^T P_t^{Y_t} \prod_{t=T_1+1}^T (1-P_t)^{1-Y_t} = \prod_{t=1}^T P_t^{Y_t} (1-P_t)^{1-Y_t}$$

If the two preceding equations are substituted into the likelihood function and it is then maximized with respect to  $\beta^*$ , the resulting coefficients are the probit estimates (Hanushek and Jackson, 1977). This is accomplished by solving a system of equations obtained by calculating the first derivatives of the likelihood function, and then setting the result equal to zero.

The resulting coefficients from probit analysis are similar to those of ordinary least squares regression in that they represent a change associated with the index I for each unit change in the independent variables.

By investigating the t-ratio associated with each coefficient, the researcher can discover whether the coefficient is significantly different from zero, or in other words, whether the variable associated with the coefficient makes a significant contribution to the model explaining the variance of the dependent variable. The probit analysis for this dissertation was accomplished through the use of a computer program known as SHAZAM (White, 1981).